



# **GUIDANCE FOR AQUATIC PLANT MANAGEMENT IN LAKES AND PONDS**

As It Relates to  
the Wetlands  
Protection Act

Department of Environmental Protection  
Bureau of Resource Protection  
Wetlands/Waterways Program  
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# Acknowledgements

Aquatic plants are a valuable part of aquatic ecosystems providing cover, habitat, and food for many species of fish and aquatic wildlife. However, noxious and invasive aquatic plants can harm water quality, impair fish populations, and interfere with navigation and recreation. Noxious aquatic plant species can form dense growth that can pose safety problems for swimmers and boaters, as well as degrading wildlife habitat by competing with native species and changing the balance of the ecosystem.

This document is intended to assist and guide individuals in meeting the requirements of state laws and rules.

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## I. Purpose and/or Summary

The purpose of this document is to provide guidance for the issuing authority (the Conservation Commission or the Department of Environmental Protection - the "Department") in the review of aquatic plant management projects proposed to control abundance and distribution of aquatic vegetation under the Wetlands Protection Act Regulations (the "Regulations"). For the purposes of this guidance, "aquatic plants" refers to plants having the four commonly recognized growth forms of aquatic plants: floating unattached, floating attached, submerged and emergent. Reference to aquatic plants in this guidance shall also include algae. This guidance is applicable to waterbodies defined as lakes and ponds in the Regulations (310 CMR 10.04) and not to rivers (310 CMR 10.58(2)(a)(1)(e)). Additional technical information on all lake management methods is provided in the Final Generic Environmental Impact Report on Eutrophication and Aquatic Plant Management (FGEIR), scheduled for publication in April 2004 by the Department of Conservation and Recreation (DCR) in cooperation with DEP. When the FGEIR is published, a link will be provided on DEP's website, <http://mass.gov/dep> and on DCR's website, <http://mass.gov/dem/programs/lakepond/lakepond.htm>.

## II. Applicability

### A. Projects Subject to the Regulations

Aquatic plant management projects in lakes and ponds are subject to the jurisdiction of the Wetlands Protection Act (the "Act"), MGL Ch. 131, § 40 and the associated regulations in 310 CMR 10.00 (<http://mass.gov/dep/brp/ww/regs.htm>). Projects must comply with the general performance standards established for each applicable resource area in the regulations (i.e. 310 CMR 10.54, 10.55, 10.56, 10.57) unless the project is "limited" (310 CMR 10.53(4) or 310 CMR 10.53(3)(I)). If wildlife habitat thresholds described in the general performance standards are exceeded, the requirements of 310 CMR 10.60 for wildlife habitat must be met (e.g. a wildlife habitat evaluation shall be performed).

No project may be permitted which will have any adverse effect on specified habitat sites of rare vertebrate or invertebrate species (310 CMR 10.59).

### B. Limited Projects

#### *310 CMR 10.53(4) - Improve the Natural Capacity of a Resource Area*

Applicants proposing a limited project under 310 CMR 10.53(4) must demonstrate that the project will improve the natural capacity of a resource area(s) to protect some or all of the interests of the Wetlands Protection Act (WPA). To meet this test, a project must improve the natural ability of a resource area to protect public or private water supply, ground water, fisheries, wildlife habitat, or to provide flood control, storm damage prevention, and/or to prevent pollution. Although a project does not need to improve the natural capacity of the resource area to protect all of the interests of the act, it must improve at least one interest and it should minimize the adverse affect on the interests that are not targeted for improvement. Projects that would usually qualify as limited projects under 10.53(4) include projects proposed primarily for the enhancement of fisheries habitat, projects to address eutrophication, or those that would increase dissolved oxygen or improve overall water quality in a water body. By the language of the limited project regulation, proposed projects involving removal of aquatic nuisance vegetation must demonstrate that the vegetation is a "nuisance" to the interests of the act. Non-indigenous invasive plant species constitute nuisance vegetation. However, significant increases in indigenous plant



species, if strongly linked to human activities, may also be considered.

Projects proposing aquatic plant management to improve the natural ability of a resource area to provide recreation, aesthetics, odor reduction, or other similar interests do not qualify under 310 CMR 10.53(4) because those interests are not protected by the WPA regulations. These projects would need to meet other applicable, relevant general performance standards.

#### *310 CMR 10.53(3)(l) - Water Dependent Uses*

310 CMR 10.53 (3) (l) applies only to a few cases where the work is confined to isolated areas and lower impact projects. Water dependent uses are defined in 310 CMR 10.04 and include those uses and facilities that “require direct access to, or location in, marine, tidal, or inland waters and which therefore cannot be located away from said waters.” Examples of water dependent uses and facilities are provided in 10.04 and include, but are not limited to, marinas and public recreational uses. Water dependent uses include any other uses and facilities as may be further defined as water dependent in 310 CMR 9.12 (i.e., Chapter 91 Waterways Regulations). Aquatic plant management projects may be considered accessory (310 CMR 9.12(3)) to a water dependent use if they are necessary to accommodate a principal water dependent use. Normally, projects qualifying as water dependent uses would be confined to isolated areas associated with facilities and uses at specific points around the lake. All “water dependent uses” (e.g. marinas, public recreational uses, navigational and commercial fishing and boating facilities) that qualify for this limited project must meet all the requirements of 310 CMR 10.53(3)(l). [[www.mass.gov/dep/brp/ww/files/310cmr10.pdf#64](http://www.mass.gov/dep/brp/ww/files/310cmr10.pdf#64)]

#### C. Estimated Habitats of Rare Wildlife

All projects within estimated habitat that is indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetlands Wildlife published by the Massachusetts Natural Heritage Program (MNHESP) require a determination by the issuing authority of whether or not a proposed project will have an adverse effect on rare species habitat. A copy of the Notice of Intent must be

sent to MNHESP no later than the date the application is filed with the issuing authority. A written opinion of MNHESP on whether or not a proposed project will have such an adverse effect shall be presumed to be correct by the issuing authority, unless overcome upon a clear showing to the contrary. This determination is made by MNHESP after considering a variety of factors including time of year, existing data, and characteristics of the site. No project, including those that qualify under 310CMR 10.53(4) or 10.53(3)(1), may be permitted if it will have any short or long-term adverse impact on the estimated habitat of rare vertebrate or invertebrate species as identified by procedures established under 310 CMR 10.59. This standard is intentionally stringent in order to protect the Commonwealth’s most vulnerable species.

### **III. Discussion**

Many in-lake management proposals to control aquatic plant growth associated with nutrient and sedimentation loading, involve short-term strategies with short-term effectiveness. Such strategies require repeated implementation that may result in undesirable secondary wetland and water quality impacts. To minimize these undesirable impacts, applicants (especially those with responsibility for the entire lake such as municipalities or lake associations) are strongly encouraged to develop and implement follow-up best management practices that will promote long-term nutrient and sedimentation control. Such actions should be prioritized in areas where a waterbody has been listed on the state 303(d) list as being impaired from excess nutrients, where a Total Maximum Daily Load (TMDL) is required<sup>1</sup> as a result of excessive nutrients, when State Revolving Funds, Non-point Source (319) or other grants from, or administered by, the State are available. When one or more of the following conditions exist in close proximity to the lake, watersheds are likely to be contributing high pollutant loads to lakes:



- 1) unsewered areas with older septic systems;
- 2) areas with evidence of erosion, including eroded gullies serving as sources of sediment which wash into the lake;
- 3) agricultural areas;
- 4) residential areas with landscaping and lawn care activities; and
- 5) stormwater discharges.

Best management practices (BMPs) to address pollutant loads contributed by the watershed should be commensurate with the size of the project and could include: working with local officials and others in the community to develop watershed management plans; educating area citizens; constructing, maintaining, and monitoring structural BMPs; upgrading septic systems and other wastewater treatment facilities; employing erosion control measures; and/or implementing local lake protection bylaws. Conservation Commissions should recognize that some contributions of pollutants and nutrients might be coming from sources such as stormwater control structures, streets and wastewater treatment facilities that are beyond the ability of the applicant to control. Appendix A includes conditions that Conservation Commissions may use when developing Orders of Conditions. Condition #9 in Appendix A provides guidance on surveying a lake watershed and preparing an action plan to identify appropriate best management practices.

It is important to note that mitigation measures



are likely to be more effective on plants that get their nutrients from the water column (e.g., algae and non-rooted vascular plants) than on plants that get their nutrients from the sediment (e.g., most but not all rooted plants). It is anticipated that the measures implemented to control nutrient and sedimentation loading will have cumulative and long-term benefits (e.g. > 10 years or greater) on the overall health of the lake, but those benefits may not be visible in the short term. The benefits are likely to result from slowing of sedimentation and nutrient input rather than its elimination. Therefore, Commissions should avoid linking the implementation of lake management nutrient and sedimentation controls to short-term observable results in the lake.

#### **IV. Information Required to Evaluate Impacts for ALL Projects**

Sufficient information to evaluate the environmental impacts to wetland resource areas should be submitted with the Notice of Intent (NOI) for the project. More or less information may be required depending on the scale of the project and the magnitude of its impacts. For example, a project involving harvesting in a small area of a pond, such as a cove, may not warrant delineation of resource areas around the entire pond, but, rather, only those in the immediate vicinity. The information detailed below should be presented in a NOI in order for the issuing authority to determine whether the proposed project would protect the interests of the Act. Aquatic weed control projects may qualify as “limited projects” under the Wetland Regulations (See Section II. B.).

##### A. Control of Target Species

1. A map showing the distribution and density of target and non-target plants and all inlets and outlets to the water body, including any control structures. Provide an overall plan of adequate scale, size and detail to accurately and completely describe the site and proposed work to be performed.



2. Discuss factors that make it conducive for target species to propagate in the lake/pond, including whether plants spread to the lake by boats from other lakes; nutrient contribution from septic systems, stormwater or other sources; whether nutrient loading from the flooding of nutrient rich soils near shallow impoundments is contributing to the problem. Any factors that may significantly affect long-term management success should be addressed.

3. Develop a pre- and post-management monitoring program to identify new growth of target species in early stages. Strategies to address new growth should be considered and implemented (e.g. harvesting, benthic barriers). Ongoing monitoring of water quality (e.g., dissolved oxygen and temperature at various strata in the lake, nutrient levels, water clarity) as well as visual inspection for invasive species will assist in the development of long-term management plans and provide the basis for management strategies that will maintain overall health of the lake ecosystem. Information on DCR's Weed Watcher Program is a resource for training and monitoring efforts and can be found at <http://mass.gov/dem/programs/lakepond/lakepond.htm>.

4. Applicants should describe any efforts proposed for long-term management of the lake and how they will move away from exclusive use of short-term management methods (*See Section III-Discussion*).

### B. Protection of Resource Areas

1. Identify all affected wetland resource areas and quantify proposed impacts. If no direct impacts are proposed to adjacent resource areas (e.g., herbicides and drawdowns), and in most cases when proposing treatment of expansive areas (e.g., drawdowns), resource areas may be delineated using DEP Orthophoto Wetland Maps that are available from MassGIS (<http://www.state.ma.us/mgis/>), local Conservation Commissions, and/or DEP (if not available, National



Wetland Inventory maps may be used) rather than using full Bordering Vegetated Wetlands (BVW) delineation procedures.

2. Include a discussion of how the project will protect the interests of the Act, including public and private water supplies and groundwater. This discussion should demonstrate an understanding of the area surrounding the lake in which the activity is proposed. This discussion should also include an analysis of alternative strategies and whether they would avoid or minimize impacts to the resource areas.

### C. Work Description

1. Provide a site-specific work description and plan, including details of treatment methodologies and a full description of impacts to resources such as vegetation to be removed, non-target plant and fisheries species, etc., that reflect the actual, as opposed to generic, site conditions. If harvesting is proposed, the ultimate disposal location of the vegetative spoils should be disclosed and should be outside of wetland resource areas or buffer zones.

2. Provide details of erosion controls, site access, staging areas, timetables for work and/or application of chemicals, name of supervisor or person on call who takes responsibility for work, and any other important construction considerations that might result in a resource area impact.

### D. Rare Species and Other Critical Resources

1. Identify specific estimated habitat as indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetlands Wildlife (if any) published by the Natural Heritage and Endangered Species Program (NHESP).

2. If the activity proposed is located within an estimated habitat, the project proponent must follow the procedures detailed in 310 CMR 10.59 and document by a letter from the NHESP the absence of rare wildlife species habitat or that a project will not adversely affect the habitat if present in the project area (310 CMR 10.59).

3. Identify any Outstanding Resource Water (ORW) as defined by 314 CMR 9.00 (e.g. public water supplies and their tributaries, vernal pools). See the discussion on Water Quality Certification at Section X.

4. Activities conducted by water suppliers in public water supplies that involve “maintaining, repairing or replacing, but not substantially changing or enlarging, an existing and lawfully located structure or facility used in the service of the public and used to provide ...water...” are exempt from the provisions of the Act and its regulations.<sup>2</sup> However, impacts to adjacent or downstream wetland resource areas may result from activities conducted by water purveyors that may be subject to the Act (e.g. sedimentation of downstream resource areas). Therefore, it is recommended that water suppliers inform Conservation Commissions of these activities prior to their commencement. If an applicant other than the water supplier proposes an aquatic plant management project within a public water supply or tributary, notice should be given to the water supplier prior to filing a NOI with the Conservation Commission.

### E. Fisheries

1. Identify fisheries present in the project area; describe how the existing aquatic vegetation serves as fish habitat in terms of breeding habitat, food resources, and escape cover; indicate if the lake/pond is stocked; and ensure that any impact to existing fisheries habitat is minimized, and if possible, that the fishery will be enhanced.

2. Discuss the positive and negative impacts of the project on the fisheries. When possible, lake management activities should be planned to avoid the spawning and stocking

period for indigenous fish. Fish spawning generally occurs in the spring or fall. Some common Massachusetts fish species and their spawning seasons are listed in the FGEIR. Some lake management techniques can result in fish kills, significant modification of benthic habitat, impact cold-water fisheries, or may need approval (*see Drawdown, Section V*) from the Department of Fish and Game (DFG). While all techniques have the potential to have adverse effects on fisheries, the selected treatment technique should balance short-term adverse effect on fisheries against the long-term improvements to the lake. The FGEIR and DFG can provide guidance about the potential effects of fisheries on specific techniques.

3. Discuss how fisheries habitat will be protected (e.g. preservation of high quality aquatic beds, create more edge effect, improved balance in ratio of forage fish to game fish).

### F. Wildlife Habitat

1. The Department presumes that non-indigenous aquatic plants within lakes ponds are not “significant to the protection of wildlife habitat”, either in whole or as a component of a larger plant community.<sup>3</sup> As such, the control or elimination of non-indigenous aquatic hydrophytes within lakes or ponds will not exceed any threshold established at 310 CMR 10.56(4)(a) 4 or 310 CMR 10.60, providing that work is designed and carried out using the best practical measures (BMPs). The BMPs should include measures to control the following: erosion, suspension or transport of pollutants, increases to turbidity, the smothering of bottom organisms, the accumulation of pollutants by organisms, and the destruction of fisheries habitat.

2. If required by performance standards for individual resource areas (e.g. land under water, bordering land subject to flooding), applicants should discuss the potential impacts on wildlife habitat and the issuing authority may condition the project to protect wildlife as described in the regulations at 310 CMR 10.60. For projects that exceed the threshold

established for work in LUW at 310 CMR 10.56(4)(a) 4, See Appendix B: *Guidance for Achieving Compliance with “Wildlife Habitat Evaluations” (310 CMR 10.60) for Aquatic Plant Management Projects in Lakes and Ponds.*

3. The elimination or reduction in population of non-indigenous aquatic plants within lakes or ponds may promote an increase in indigenous plant and animal diversity and/or edge effect habitat. This change is likely to improve wildlife habitat and serve as restoration per 310 CMR 10.60.

## V. Additional Information Required for DRAWDOWN Projects

Drawdown duration must be temporary (i.e., not permanent) and no longer than the minimum time necessary to accomplish aquatic nuisance plant control. Certain plant species may decrease, increase or have a variable response to drawdown and those factors should be considered. Although many drawdowns are annual treatments, periodic review of dam safety and wildlife/fisheries habitat should be conducted through regular monitoring.

Parties responsible for lake drawdown projects, including those that have been historically and systematically conducted pre-1983, should file for and receive an Order of Conditions for up to 5 years in accordance with 310 CMR 10.05 (6) (d), as long as the drawdown procedures (including water levels and timing) remain the same within that timeframe (with regular monitoring as described in the preceding paragraph).

### A. Fisheries

1. The DFG should be consulted for potential fisheries impacts prior to filing the NOI (See [www.state.ma.us/dfwele/dfw](http://www.state.ma.us/dfwele/dfw)). The project proponent should comply with guidelines from DFG detailed in Section 4.2.6.3. of the FGEIR to the maximum extent feasible and provide evidence of such coordination in the NOI.

2. Lake drawdown has the potential to decrease the level of dissolved oxygen in the water column and can result in fish kills. During coordination with DFG, the project proponent

should provide an estimate of the total area and depth zones to be dewatered, and should verify the presence of a deep-water pool or other refuge areas with sufficient dissolved oxygen levels to prevent fish kills.

3. It is advisable to commence lake drawdown between November 1 and December 1 and complete lake refill no later than April 1 to minimize impacts to fish spawning and other non-target organisms that may have water level requirements for reproduction.<sup>4</sup> Also, placement of temporary check dams upstream of the lake may inhibit access of fish to spawning areas in tributary streams. Applicants should avoid drawdowns in any tributaries in which Atlantic salmon restoration efforts are being conducted during October and November since it may cause siltation of spawning beds downstream (Contact the DFG to identify such tributaries). During drought conditions, refill should begin earlier to ensure adequate water for spring fish spawning (such as pickerel). Anticipated dates for the commencement and duration of drawdown as well as duration and completion of refill should be provided.

4. Estimated upstream and downstream flow rates during drawdown and refill should be provided to ensure sufficient flow rates at all times to maintain fisheries. During drawdown, downstream flow rates should be equal to flow rates expected under normal conditions, since changes in stream flow can impact fish populations (different species habitats are dictated by depth, current velocity and area, and stability of flow). To protect fisheries resources, the DFG recommends that the drawdown rate not exceed 4 cubic feet per second per square mile of drainage area (cfs/m), as measured at the outlet structure, or not exceed three inches of lake elevation change per day, whichever results in the lower downstream flow rate. This drawdown rate and the time of year guidance provided in *Section B - Wildlife Habitat (below)* are general guidance that would apply to many water bodies. However, because some lakes will require higher flow rates or longer drawdown periods due to lake volume, drawdown conditions exceeding those recommended in these paragraphs should be weighed against

potential impacts to fisheries or wildlife on a case-by-case basis. Once the drawdown level has been achieved, lake outflow must equal lake inflow for the duration of the drawdown. During the lake refill period, DFG recommends that 0.5 cfs/m be maintained at the outflow. While this flow rate is considered optimal for all life stages of fish, the flow rate which occurs at a specific location is dependent on the watershed size, geology and stream regulation devices such as dams and outlet structures, and should be determined by flow sampling prior to the initiation of the project, or by consultation of stream gage records in the area. Stream flow may be estimated by using the United States Geological Survey's StreamStats program.<sup>5</sup>

Applicants should propose a contingency strategy (such as adjusting outlet structures) to maintain downstream flow in the event of drought conditions.

## B. Wildlife Habitat

The project proponent should include a discussion on how impacts to wildlife habitat will be minimized by coordinating the timing of the drawdown versus the presence of amphibian eggs, and the start of hibernation or brumation periods and any reductions in emergent vegetation preferred by wildlife species. Amphibians, reptiles, and other aquatic organisms need to be able to move to deeper water before ice formation and substrate freezing. Aquatic mammals need to locate alternate lodge sites, and beavers need to relocate food caches before ice formation. Therefore, the completion of the drawdown should, whenever possible, be accomplished by December 1. For most amphibians in Massachusetts, the primary reproductive period occurs between March and the end of August with the greatest percentage of hatching and transformation occurring by mid-July. Gradual reduction in water levels over a two to three-



week period (i.e. November 1 to December 1) is important to allow for adjustment to the new water level by wildlife.

## C. Public and/or Private Water Supplies

1. The Applicant should determine the presence of shallow wells or water supply intakes, the operation of which could be impaired during a drawdown.

2. The Applicant should describe mitigation to be provided if adverse impacts to water supplies cannot be avoided.

## D. Dam or Other Outlet Control Structures

1. The applicant should describe what type of structure is to be used to accomplish the drawdown.

2. The Applicant should document the rate of drawdown (inches/day), duration of drawdown (*see A.3 above*), and contingency plan for closure if the structure is stuck in the open position. Note that the DCR Office of Dam Safety (DCR-ODS) recommends that in most cases, for safety purposes, drawdown rates should not exceed 6 inches/day. However, if fisheries are present, the maximum drawdown rate should not exceed those recommended by DFG as described in Section V. A. 4. The DCR-ODS also recommends that drawdowns be conducted slowly and that timeframes be minimized to avoid any structural damage to the dam. The DCR-ODS should be contacted for comment on the project and those comments should be submitted with the application.

## E. Bordering Vegetated Wetlands (BVW)

Drawdowns Commenced after November 1 with refill completed by April 1 will contribute to the protection of bordering vegetated wetlands (BVW). Variability in this date is



permissible on a case-by-case basis. However, completion of the drawdown by December 1 is recommended whenever possible since it will allow wildlife to move to deeper water, locate alternate lodge sites or relocate food caches prior to ice formation and substrate freezing (*See Section V. B.*) and will minimize impacts to fish spawning and other non-target organisms that may have water level requirements for reproduction (*See Section V. A. 3*).

#### F. Flood Control and Storm Damage Prevention

The applicant should discuss the potential for downstream flooding and erosion during the drawdown period. Documentation of downstream flow rates and the maximum lateral extent of flooding during drawdown should be provided. Flow rates may be measured using flow meters, weir measurements, or thorough calculations. Flow rate monitoring should be conducted during drawdown, and a contingency plan should be developed prior to drawdown and implemented in the event that flow rates change during heavy precipitation events. Measures to prevent flood damage should be identified and discussed by the project proponent and implemented when conducting the project. Any drawdown allowed should be conditioned to occur gradually and to allow for a measured reduction in water levels over a two- to three-week period to avoid sudden downstream flooding and erosion.

#### G. Water Quality

The project proponent should discuss potential impacts from the project to productivity, nutrient cycling, sediment inputs, and potential for algal blooms. Erosion and sedimentation controls, removal of accumulated sediments prior to drawdown, and other appropriate measures to minimize the potential for flushing nutrients, sediments, and other pollutants to downstream lakes and ponds also should be addressed.

## **VI. Additional Information Required for HERBICIDE/ALGICIDE Projects**

### A. Water Quality

1. An Application to Apply Herbicide(s) to the Waters of the Commonwealth (BRP WM 04) must be submitted to the DEP Office of Watershed Management unless the project falls under an exception as specified on BRP WM 04 application form. This license reviews proposed chemical applications to aquatic systems (traditionally lakes and ponds) to ensure that the area is being treated utilizing currently acceptable procedures and materials, in order to maintain environmental and public health to the maximum extent possible under the circumstances. The license also serves as a record of chemicals that have been introduced to specified areas. The license grants approval to apply chemicals for the control of nuisance aquatic vegetation in accordance with authority granted to the Department by MGL Ch. 111 § 5E.

Prerequisites that must be considered prior to filing for the BRP WM 04 license include:

- a. Any individual who plans to use aquatic herbicides in Massachusetts must be in possession of the appropriate pesticide credential issued by the Department of Agricultural Resources;<sup>6</sup>
- b. Chemicals used for treatments must be currently approved for use in the state by the Pesticide Bureau; and
- c. The final Order of Conditions or Negative Determination of Applicability must be obtained prior to treatment. If a copy of the BRP WM 04 license is not included in the Notice of Intent or Request for Determination, then it is recommended that a condition be included in the Order of Conditions requiring that a copy of the approved BRP WM 04 license be submitted to the Conservation Commission prior to the commencement of work.

License applications can be obtained from the DEP Web site <http://www.mass.gov/dep> and must be submitted to the Division of Watershed Management, 627 Main Street, 2nd Floor, Worcester, MA 01608 at least 30 days prior to the proposed date(s) of treatment.

2. Regarding public drinking water supplies, 310 CMR 22.20B (8) states that “No person shall apply herbicides to any surface water body including, but not limited to, any reservoir or their tributaries, which serve as a source of public water supply without a license issued by the Department pursuant to MGL Ch. 111, § 5E. This requirement does not apply to the application of algicides containing copper by the public water system. However, the public water system shall notify DEP in writing prior to the application of such algicides.

The application of the herbicide 2,4-D is not permitted in any lakes or ponds that either abut or are within an Interim Wellhead Protection Area (IWPA) or a Zone II for a public water supply well; or are within a Zone A, B, or C for a public surface water supply. The application of the herbicide 2,4-D in any lakes or ponds that are within certain geological settings and distances of private water supply wells used for potable purposes will be conditioned to require the applicant to provide notice (*see attached notice language*) to the owners of record abutting the lake. The imposition of these restrictions is accomplished through the issuance of an *Herbicide Application Permit* by DEP in accordance with the procedures established by the “*Protocol for the Application of 2,4-D to Lakes and Ponds in Massachusetts*” (*See Appendix C*). The Herbicide Application Permit will require the applicant to undertake sampling of at least three private wells within the applicable downgradient setback distance in accordance with a Department approved sampling plan designed to detect 2,4-D in the wells. If any 2,4-D is detected, then property owners with wells within the applicable downgradient setback distance will be provided notice of the test results and will be provided with bottled water by the applicant at their request for the remainder of the 150 day period in which 2,4-D may pose a risk to persons using the water as their primary

source of drinking water. If, after 150 days, sampling shows 2,4-D levels not declining and not less than half the MCL, the proponent will contact DEP to determine how much longer to provide bottled water. Distance setbacks for private potable sources are dependent upon the geologic material within which the property is located. Any exceptions to these exclusionary conditions will be handled on a case-by-case basis and will require additional hydrologic or hydrogeologic assessments as specified by DEP.<sup>7</sup> Please see the FGEIR for detailed discussion about the toxicological and environmental fate profiles of 2,4-D and a number of other herbicides commonly used for lake management.

3. Application of herbicides has the potential to result in fish kills due to low dissolved oxygen under the following circumstances: high water temperature, high plant biomass to be controlled, shallow nutrient-rich water, high percentage of the lake to be treated, closed or non-flowing system.<sup>8</sup> Under these conditions, avoidance or limited application of herbicides is advisable.

4. Depending on specific circumstances, potential mitigation measures may be considered for herbicide treatments. Conservation Commissions should review the herbicide chapter of the FGEIR for the specific herbicide proposed and discuss the use of the herbicide with the individual proposing the work and in possession of the appropriate pesticide credential issued by the Department of Agricultural Resources (DAR).

## VII. Additional Information Required for Harvesting Projects

1. Areas of target species for control and areas of non-target species should be identified and indicated on a map of appropriate scale.





2. Methods for minimizing turbidity during harvesting should be identified and implemented when feasible.

3. A method for collection of plant material that is cut and a disposal location of plant material that is to be removed from the water body should be identified in order to prevent decomposition that may result in lower dissolved oxygen in the water column.

### VIII. Additional Information Required for Dredging Projects

1. For projects involving dredging or disposal of sediment volumes greater than 100 cubic yards, a 401 Water Quality Certificate must be obtained from the DEP Wetlands Program in the Boston Office to ensure that the proposed project is in compliance with existing water quality standards. Chapter 91 considerations may also apply. See Section X A. for further information on Chapter 91, and Section X C. for further information on Water Quality Certifications.

2. The information required to permit dredging project is extensive and includes the following:

- a. Plans and cross-sections of the current and proposed conditions prepared by a qualified professional,
- b. Calculations of area to be dredged and the volume of sediment to be removed,
- c. Physical and chemical characterization of the sediment,
- d. Procedures for land side management of the sediment (e.g., dewatering, transport), and
- e. Plans for the use, or proper disposal, of the dredged material.

Some dredging projects fall within the jurisdiction of Army Corps of Engineers and may require a Federal permit. The Corps can be contacted at 1-800-343-4789.

### IX. Pioneer Infestations

Projects involving monitoring for and/or eradicating pioneer infestations of non-native invasive aquatic species in public lakes or ponds in Massachusetts will improve the natural capacity of a resource area(s) to protect the interests of the Act, and are anticipated to have minor impacts (See Section IV F1). These projects typically propose to eradicate pioneer infestations through hand pulling or benthic barriers. Further, these projects are expected to improve the natural capacity of resource areas to protect the interests of the Wetland Protection Act and thus, qualify as a limited project as defined by 310 CMR 10.53 (4). DEP endorses the issuance of a Negative Determination of Applicability when these projects are conducted in accordance with the management techniques approved by DEP and described in the DCR Guidance, *Standard Operating Procedures for Hand Pulling of Aquatic Vegetation and Benthic Barriers to Control Aquatic Vegetation* dated May 15, 2003. The guidance can be obtained from the DCR Office of Water Resources, 251 Causeway Street, Suite 600, Boston MA 02114-2104. Pioneer infestations to be controlled using herbicides should be proposed under a Notice of Intent due to a higher potential to have effects on other interests of the Act.

### X. Other Related Permits/Licenses/Certifications<sup>9</sup>

#### A. MGL Chapter 91, the Public Waterfront Act:

Where dams are licensed under Chapter 91, the license conditions often allow for annual drawdowns to occur to specific levels. However, if drawdowns are sought to lower levels, new authorization must be obtained. Additionally, Section 310 CMR 9.05(2)(e) of the Waterways regulations states:

*“...an application for a permit or permit amendment shall be submitted to the Department for the following activities unless the applicant includes such activities in a license application:*

*(e) Any lowering of the water level of a Great Pond, except a body of water used for agriculture, manufacturing, mercantile, irrigation, insect control purposes, or for flowing cranberry bogs, or for public water supply, in accordance with MGL Ch. 91, § 19A.”*

Note that this jurisdiction also applies to enhanced Great Ponds (ponds whose footprints have been enlarged by impoundments). Since Chapter 91 jurisdiction is associated with the water column, structures and activities are regulated in enhanced Great Ponds the same as in Great Ponds.

Dredging projects also require approval under Chapter 91. In addition to dredging projects involving sediment removal, Chapter 91 regulations define as dredging “the removal of materials including ... plant or animal matter, in any excavating, cleaning, deepening, widening or lengthening, either permanently or temporarily”. Therefore, a dredge permit would need to be obtained for mechanical harvesting of plant material unless the cutting and harvesting of the plant material does not disturb the bottom sediment (in which case it would not be considered “excavating” or “cleaning”).

## B. Water Management Act

Drawdown projects may fall under the jurisdiction of the Water Management Act (MGL Ch. 21G). Any project that includes the withdrawal, through pumping or other artificial means other than the removal of boards or other manipulation of a dam structure, of 100,000 gallons per day (or total withdrawal of nine million gallons over a three month period), will require a Water Management Act permit. If the Water Management Act applies, the project proponent should obtain a withdrawal permit from DEP’s Drinking Water Program prior to initiating any work.

## C. Water Quality Certification (314 CMR 9.00)

Water Quality Certification (WQC) is required under the federal Clean Water Act for certain activities in jurisdictional wetlands and waters of the Commonwealth. A WQC from DEP is required for discharge of dredged or fill material, dredging, and dredged material disposal activities in waters of the United States within the Commonwealth that require federal licenses or permits. The federal agency issuing a permit initially determines the scope of geographic and activity jurisdiction (e.g. the Corps of Engineers for Section 404 permits for the discharge of dredged or fill material). The Department administers the 401 Certification Program. Therefore, applications for WQC for fill and excavation in wetlands (BRP WW 10,11) should be sent directly to the DEP regional office in accordance with 314 CMR 9.00. Applications for WQC for dredging (BRP WW 07, 08, 09) should be sent to the Department’s Boston office. Remember, projects with less than 100 cubic yards of dredging or less than 5000 square feet of wetland impact are deemed approved upon the receipt of a valid final Order of Conditions.

Discharge of dredged or fill material to an ORW specifically identified in 314 CMR 4.06(1)(d) (e.g. vernal pools, within 400 feet of a water supply reservoir, and any other area so designated) is prohibited unless a variance is obtained under 314 CMR 9.08.



#### D. License to Apply Herbicide(s) to the Waters of the Commonwealth (BRP WM 04)

Pursuant to MGL Ch. 111, § 5E, a license is required for application of chemicals to water bodies for the control of nuisance aquatic vegetation, with certain exceptions as are detailed on the BRP WM 04 application form. (See Section VI. A. I)

#### Notes

1. Many hundreds of lakes are listed under Section 303(d) of the Federal Clean Water Act that requires states to identify those water bodies that are not expected to meet surface water quality standards after the implementation of technology-based controls and as such, require the development of total maximum daily loads (TMDL). Further information can be obtained at the Department's web site <http://www.state.ma.us/dep/brp/wm/tmdls.htm>

2. Note that reservoirs are considered "structures".

3. Non-indigenous (native) aquatic plants in Massachusetts include, but are not limited to: fanwort (*Cabomba caroliniana*), Brazilian water-weed (*Egeria densa*), Eurasian water milfoil (*Myriophyllum spicatum*), lesser naiad (*Najas minor*), curly pondweed (*Potamogeton crispus*), and water-chestnut (*Trapa natans*). See Figures 1-10, 1-11, and 1-12 of the Final GEIR published in 2004.

4. See FGEIR, Section 4.2.6.3

5. The USGS StreamStats Interface help page which contains a tutorial before the user can open Streamstats is: <http://ststdmamrl.er.usgs.gov/streamstats/>. The expert page link to Streamstats which skips the tutorial is: <http://ststdmamrl.er.usgs.gov/streamstats/expert.htm>. You may access an interactive map of Massachusetts depicting each continuous stream gage at: [http://water.usgs.gov/cgi-bin/daily\\_flow?ma](http://water.usgs.gov/cgi-bin/daily_flow?ma) or an electronic text list of continuous stream gages at <http://waterdata.usgs.gov/ma/nwis/current?type=flow>.

6. The majority of herbicides registered in Massachusetts for aquatic use are classified as general use products. At a minimum, the state pesticide law (Chapter 132 B of the MGL) requires that all persons who use products classified as general use must be in possession of a current and valid commercial applicator's license. However, several herbicides registered and labeled for aquatic use in Massachusetts are classified as restricted use products (RUP's). These RUP's can only be used by individuals who possess a current and valid commercial certification in the certification subcategory code 39 (aquatic weed control). Also note that DEP holds a seat on the Pesticide Board to provide input on wetland and other environmental matters.

7. The Department's Office of Research and Standards (ORS) memo dated September 9, 1999.

8. See MDFW Performance Standards for the Protection of Fisheries Resources for Herbicides and Algicides submitted to Mike Gildesgame of the Department of Conservation and Recreation in a letter dated September 27, 2002. Also see FGEIR.

9. For additional information on regulatory requirements, see the FGEIR.





# A Appendices

## Appendices:

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## Appendix A: Sample Conditions

The sample conditions provided below contain suggested language and are intended for the use of the issuing authority in drafting Orders of Conditions.

1. This Order approves the [Insert specifics: application of herbicides, harvesting activities, etc.] specified in the permit application for the time period of [month/year] to [month/year].

2. Prior to any work, the boundary of significant wildlife habitat shall be delineated, mapped, and approved by the issuing authority. The boundary of significant wildlife habitat shall serve as the “limit-of-work” line. The boundary of significant wildlife shall be delineated by the use of weighted floats distributed along the “limit-of-work” line at intervals of no greater than 100 feet, unless the applicant proposes some other methodology that is approved by the issuing authority. No [aquatic herbicides shall be placed, harvesting shall occur etc.] in the area between the shore and the “limit-of-work” line.

3. *[For Herbicide Application Only]* The applicant or his/her designee shall obtain a valid BRP WM 04 Permit for the application of aquatic herbicides and/or algicides for designated target species [name of target species] and a copy of such BRP WM 04 permit shall be submitted to the Conservation Commission prior to initiating any treatment of aquatic vegetation permitted by this Order.

4. *[For Herbicide Application Only]* All application of herbicides approved for use by this Order shall be applied by an applicator licensed (in the aquatic weed category) by the Massachusetts Department of Agricultural Resources (DAR), Pesticide Bureau. Applications shall follow all product label directions.

5. *[Use this condition for projects that do not qualify as a limited project, or for projects warranting a wildlife habitat analysis due to presence of specific habitat characteristics detailed in Appendix B]* A Wildlife Habitat Evaluation shall be prepared by a person with the qualifications detailed at 310 CMR 10.60(1)(b) and shall describe the plant community distribution, composition, and structure between the shore and the “limit-of-work” under existing and post-treatment conditions. The report shall be prepared in accordance with the Appendix B of the *Guidance for Aquatic Plant Management in Lakes and Ponds as it Relates to the Wetlands Protection Act*, dated June 2003. The existing condition analysis shall be completed prior to the [application of herbicides, harvesting etc.]. In the following year the applicant shall complete the post-treatment portion of the Wildlife Habitat Evaluation and shall submit the evaluation to the issuing authority within thirty (30) calendar days of the last day of [application of herbicides, harvesting, etc.].

6. A status report updating the Wildlife Habitat Evaluation shall be submitted within two years of the last date of application and shall capture two growing seasons. The report shall include a discussion and conclusion as to the extent to which an “adverse effect”, as defined at 310 CMR 10.60(1)(a), to significant “wildlife habitat characteristics” has resulted from the project. If a conclusion of an “adverse effect” is made in the report, or independently determined by the issuing authority, then the applicant shall demonstrate compliance with 310 CMR 10.60.

7. In the event of any fish kill within [name of lake or pond], the applicant and licensed applicator shall immediately contact the Department’s Emergency Response section at [phone number for region]; the Department of Fish and Game’s Westborough office at (508) 792-7270 (during normal working hours); or the Boston 24-hour response line at 1-800-632-8075.



8. Refueling, servicing, and repair of motorized watercraft and service vehicles associated with the lake surveys and treatments shall take place at least 100-feet from boundary of the resource area. Equipment operators shall be prepared to immediately respond to, and contain, accidental releases of fuel, motor oil, or aquatic herbicides. On-site absorbent materials shall be maintained for use in containing accidental spills. If an accidental release of fuel, motor oil, lubricating oils, etc. occurs, the issuing authority shall be immediately notified, and contaminated areas shall be treated according to guidelines established by the DEP's Bureau of Waste Site Cleanup (BWSC). Staging and long-term storage of aquatic herbicides and/or algicides shall take place outside the jurisdiction of the Department.

9. *[See guidance in Section III–Discussion, and use or edit this condition only as appropriate for a problem that clearly has a watershed source]* Prior to a repeat of the lake management technique allowed by this Order the applicant shall survey the lake watershed using the techniques described in the publication, “*Surveying a Lake Watershed and Preparing an Action Plan*” published by DEP, 2001. This document may be accessed through the Department’s web page at <http://www.state.ma.us/dep/brp/wm/volmonit.htm>.

Following completion of the lake watershed survey, the Commission [or Department] recommends public education measures be undertaken, and that erosion and sedimentation control, and storm water and wastewater management measures be implemented as appropriate to address long term water quality impacts within the watershed. The Commission [or Department] reserves the right to condition future lake management proposals to address pollution inputs within the reasonable control of the applicant.

10. Following completion of the project, the applicant shall request a Certificate of Compliance and include an affidavit signed by the licensed applicator stating that the aquatic vegetation has been treated in accordance with the requirements of this Order of Conditions. All weighted floats used to demarcate the limit of work line shall be removed from the waterbody.

11. During drawdown, water levels shall be reduced gradually over a two to three-week period (i.e. between November 1 to December 1) to allow wildlife to move to deeper water, locate alternate lodge sites, or relocate food caches prior to ice formation and substrate freezing; and to minimize impacts to fish spawning and other non-target organisms that may have water level requirements for reproduction.

12. During dredging projects, siltation controls shall be utilized to prevent and minimize downstream siltation to resource areas.

13. During mechanical cutting and harvesting projects, areas of target species for control and areas of non-target species shall be identified and indicated on a map of appropriate scale. The applicant shall take all feasible measures to avoid impacts to non-target species.

14. Methods for controlling turbidity during mechanical cutting and harvesting shall be in place during the project if they are determined to be feasible.

15. *[Use this condition for mechanical cutting/harvesting projects]* Plant material that is cut shall be collected, removed from the water body, and disposed of [in the disposal location identified in the Notice of Intent] [or specify a location] in order to prevent decomposition that may result in lowered dissolved oxygen in the water column.

16. The applicant shall develop a pre- and post-management monitoring program to identify new growth of target species in early stages. Strategies to address new growth should be considered and implemented (such as harvesting or benthic barriers) to assist in the development of long-term management strategies.

## **Appendix B**

### **Guidance for Achieving Compliance with “Wildlife Habitat Evaluations” (310 CMR 10.60) for Aquatic Plant Management Projects in Lakes and Ponds**

#### **Introduction**

In order to protect significant wildlife habitat, safe zones that remain free of herbicide applications should be established around the perimeter of all lakes and ponds should be established around the perimeter of all other important habitat features listed below. Plant management activities within these zones should be limited to the following BMPs: (1) direct application of herbicides to non-indigenous species that occur within areas inhabited by indigenous hydrophytes; and/or (2) eradication of nuisance species using methods described in Section IX- Pioneer Infestations. An exception to the imposition of these safe zones may be considered by the issuing authority if prohibition of work within these zones would preclude whole lake aquatic plant management strategies. DEP presumes that non-indigenous aquatic plants within lakes and ponds are not “significant to the protection of wildlife habitat,” either in whole or as a component of a larger plant community. (Note that this Appendix does not apply to drawdown projects. Requirements for drawdown projects are detailed in Section V.)

#### **Significant Wildlife Habitat Characteristics**

Safe zone within five feet (5') of:

- The perimeter of all lakes and ponds measured from the Mean Average Low Water Line (MALWL) horizontally into the lake or pond.

In addition, if feasible, safe zones should be established around the perimeter of the other important habitat features listed below as follows:

Within five feet (5') of:

- Any stand of indigenous emergent hydrophytes of sufficient density to provide escape shelter from predators, and/or nesting habitat for indigenous vertebrate wildlife. <sup>1</sup>

- Any stand of rooted, floating and/or submerged indigenous aquatic plants that has the potential to provide egg attachment or deposition sites for amphibians, and/or serves as a food source, either directly, or indirectly, to any species of vertebrate wildlife;

Within forty feet (40') of:

- Any muskrat house or feeding shelter;
- Any active or abandoned beaver lodge, underwater dam or dam remnant, or by-pass canal;
- Any island having a land mass situated above the elevation of the MALWL to provide basking sites, roosts, “haul-outs”, perching sites, and/or denning/nesting sites for indigenous, vertebrate wildlife, and when stands of indigenous, aquatic and/or emergent plants are present in adjacent waters.



Although not subject to the safe zone practices described above, all projects should avoid the following wildlife habitat characteristics during construction or operation to the maximum extent practicable:

- Any rock outcropping which projects above the elevation of the MALWL that can serve as a basking site, roost, perch, or “haul-out” for indigenous, vertebrate wildlife;
- Trunks, root systems, stumps, and limbs which project above the elevation of the MALWL, and that can serve as a cavity nest, rookery, basking site, roost, perch, or “haul-out” for indigenous, vertebrate wildlife.

#### Notes

<sup>1</sup> Emergent hydrophytes potentially meeting this definition include: lake sedge (*Carex lacustris*), tussock sedge (*Carex stricta*), bayonet rush (*Juncus militaris*), Pickerelweed (*Pontederia cordata*), common arrowhead (*Sagittaria latifolia*), chair-maker’s rush (*Scirpus americanus*), river bulrush (*Scirpus fluviatilis*), soft-stemmed bulrush (*Scirpus tabernaemontani*), woolly bulrush (*Scirpus cyperinus*), common cattail (*Typha latifolia*), Narrow-leaved cattail (*Typha angustifolia*).



## Appendix C

### Protocol for the Application of 2,4-D to Lakes and Ponds in Massachusetts

*[Note: This document is for use by DEP to evaluate 2,4-D in herbicide license applications pursuant to BRP WM 04 and is included in this policy for Conservation Commission information only]*

#### General:

The purpose of this protocol is to establish the criteria for which the application of the herbicide 2,4-Dichlorophenoxyacetic acid (2,4-D) in surface water bodies will be permitted relative to drinking water quality concerns. The application of 2,4-D is not permitted in any lakes or ponds that are either within or abut an Interim Wellhead Protection Area (IWPA) or a Zone II for a public water supply well; or in a Zone A, B, or C for a public surface water supply. Any exceptions to these exclusionary conditions will be handled on a case-by-case basis and will require additional hydrologic or hydrogeologic assessments as specified by DEP.

DEP has established private drinking water well setback distance requirements for three types of aquifer settings. The Herbicide Application License issued by DEP will condition the application of 2,4-D to require the applicant to provide notice to the owners of record of properties abutting the lake. Applicants will also be required to undertake sampling of at least three private wells within the downgradient setback distance in accordance with a Department approved sampling plan designed to detect 2,4-D in the wells. In the event that the upgradient/downgradient areas cannot be determined the sampling requirements will apply to wells within the setback around the entire perimeter of the shoreline. If any 2,4-D is detected then property owners will be notified of the test results and those with wells within the downgradient setback distance will be provided, at their request, with bottled water for the remainder of the 150 day period in which 2,4-D may pose risk to persons using

the water as their primary source of drinking water. If, after 150 days, sampling shows 2,4-D levels not declining and not less than half the MCL, the proponent will contact the Department to determine how much longer to provide bottled water. In the event that the upgradient/downgradient areas cannot be determined the notification and provision for bottled water requirements will apply to wells within the setback around the entire perimeter of the shoreline.

In order to have an approvable sampling plan, the proponent must submit a scaled map(s) showing the location of each private well proposed for sampling that fall within the applicable drinking water well setback distance. The setback distance is measured from the bank (i.e. the mean annual flood level of the surface water body or the first observable break in slope, whichever is lower per 310 CMR 10.54) closest to the wellhead to a point measured horizontally landward from the bank of the lake (*See below for calculation of distances based on surficial geology*). Except for the above exclusionary conditions, for all aquifer settings, if the proponent establishes that the existing residences and businesses along the developed shoreline (within the set back distances) of the lake or pond have access to a public water supply, then the application of 2,4-D will be permitted without the requirement to sample private wells.

For the purpose of this protocol, access to a public water supply shall mean the following:

1. The owner of a residence or business establishment has the ability to connect to a public drinking water supply main that currently exists on public or town owned land that abuts a portion of the property boundary; and,
2. The public water supply main is within 200 feet of the private residence/business property boundary.

If a moratorium on new hook-ups to the public water supply is in effect, then the proponent must verify that each individual developed property within the applicable setback distance is connected to the existing public water supply.



DEP has used an initial lake or pond treatment concentration of 1,750 micrograms per liter ( $\mu\text{g/l}$ ) of 2,4-D and a decay rate half-life of 29.5 days for calculating private drinking water well setback distances from lakes and ponds. This decay rate was considered adequately conservative for the purpose of establishing private drinking water well setback distances. The setback distance selected was based upon achieving a 2,4-D concentration in private well water of less than the Massachusetts Maximum Contaminant Level (MMCL) of 70  $\mu\text{g/l}$ . For the purpose of this 2,4-D protocol, DEP established a conservative household use of 480 gallons per day, which includes indoor and outdoor water use. Water use is based upon an assumed 6 person, 3 bedroom home using 80 gallons per day per person. The calculations used to establish the setback distances are conservative in that they do not take into account dispersion and retardation of 2,4-D as it travels through lake or pond sediments and aquifer formation. They lack conservatism in that they use 2,4-D decay rate estimates derived for surface waters which will be higher than rates for groundwater where there would be less microbial activity to break down 2,4-D.

#### Setback Distances for the Protection of Private Wells:

In the instance where a parcel is mapped as multiple categories of aquifer or surficial geology having different setback distance requirements, the most restrictive setback distance will be applied to the entire parcel.

#### Medium and High Yield Aquifers, Sand and Gravel, and Large Sand Deposits:

DEP has established a setback distance of 200 feet within which the applicant is required to test some private wells. This setback distance may be reduced for portions of the shoreline if DEP concurs with a more site specific hydrogeologic analysis as described below. The 200-foot setback distance will apply to all areas that are mapped by Massachusetts Geographic Information System (MassGIS) as medium and high yield aquifers, and as sand and gravel and large sand deposit surficial geology. This

distance is based upon an assumed hydraulic conductivity (K) value of 300 feet per day (ft/day), a natural groundwater hydraulic gradient of 0.0017, and an effective porosity of 39 percent. The 200-foot setback distance is based upon a concern for the potential travel-time in the downgradient direction. Dilution effects were not factored into the setback distance calculations due to concerns that in high K aquifers, some downgradient wells may receive 100 percent of their water from the infiltration of lake or pond water into the aquifer.

The proponent may conduct a hydrogeologic study to determine the direction of groundwater flow. If DEP concurs with the groundwater flow direction presented by the proponent then the setback distance requirements will be 200 feet along the downgradient shoreline. The level of effort required for the hydrogeologic study will depend upon the site-specific conditions. In some instances a simple conceptual assessment will be required to determine the general downgradient groundwater flow direction. The conceptual approach will be based upon a review of the surficial geology mapping and the topographic setting. It may also be possible to establish groundwater flow directions by conducting a literature review of published reports. In other instances where significant uncertainty exists a more complex study may have to be conducted including installation of monitoring wells and monitoring of groundwater flow directions.

Applicants will be required to provide notice to the owners of record of properties abutting the lake and to undertake sampling of at least three private wells within the downgradient setback distance in accordance with a Department approved sampling plan designed to detect 2,4-D in the wells. If any 2,4-D is detected then property owners will be notified of the results and those with wells within the downgradient setback distance will be provided, at their request, with bottled water for the remainder of the 150 day period in which 2,4-D may pose risk to persons using the water as their primary source of drinking water. If, after 150 days, sampling shows 2,4-D levels

not declining and not less than half the MCL, the proponent will contact the Department to determine how much longer to provide bottled water.

Areas of Sandy Till over Sand, End Moraines, and Flood Plain Alluvium:

A setback distance for private drinking water wells of 50 feet will apply to all areas that are mapped by MassGIS as surficial geology characterized as sandy till over sand; end moraine; and flood plain alluvium which may be reduced for portions of the shoreline if DEP concurs with a more site specific hydrogeologic analysis as described below. The notice provisions to abutters of the lake, the sampling requirements, and provision of bottled water in the event of detection of 2,4-D in private wells within the downgradient setback distance will be required as specified above. The exception will be for the areas mapped as medium and high yield aquifers that are discussed above. The 50-foot setback distance is based upon an assumed hydraulic conductivity (K) value of 30 feet per day (ft/day), a natural groundwater hydraulic gradient of 0.0017, and an effective porosity of 30 percent. The Theis nonequilibrium well equation was used to determine the additional hydraulic gradient that would be created by a residential well pumping at 480 gallons per day. For the Theis calculations the saturated thickness of the aquifer was assumed to be 20 feet. The 50-foot setback distance is based upon a concern for the potential travel-time in the downgradient direction. Dilution effects were not factored into the setback distance calculations.

As in the above case for medium and high yield aquifers, or sand deposits or sand and gravel deposits, a proponent may conduct a hydrogeologic study to determine the direction of groundwater flow. If DEP concurs with the groundwater flow direction presented by the proponent then the setback distance requirements will be 50 feet along the downgradient shoreline. See the discussion above regarding the level of effort required for conducting a hydrogeologic study.

Areas of Till or Bedrock, or Fine-Grained Deposits:

A setback distance for private drinking water wells of 25 feet will apply to all areas that are mapped by MassGIS as surficial geology characterized as till or bedrock, or fine-grained deposits. The notice provisions, sampling requirements and provision of bottled water in the event of detection of 2,4-D in private wells within the downgradient 25-foot setback distance will be required as specified above. This distance is based upon an assumed hydraulic conductivity (K) value of 0.3 foot per day (ft/day), a natural groundwater hydraulic gradient of 0.0017, and an effective porosity of 30 percent. The Theis nonequilibrium well equation was used to determine the additional hydraulic gradient that would be created by a residential well pumping at 480 gallons per day. For the Theis calculations the saturated thickness of the aquifer was assumed to be 20 feet. At a K value of 0.3 ft/day the hydraulic gradient created by the residential well becomes the controlling factor relative to groundwater flow velocity toward the well. Dilution effects were factored into this setback distance calculation based upon the assumption that the hydraulic gradient generated by pumping is the controlling factor relative to flow velocities and directions in the vicinity of the wellhead. Therefore, it is assumed that approximately equal volumes of water are drawn from all radial directions toward the well. Assuming an infiltration rate of one foot per year for bedrock/till areas, a circular area with a radius of 153 feet would be required to support a daily withdrawal volume of 480 gpd. At a distance of 25 feet from a lake or pond shoreline, approximately 42 percent of the calculated contributing area would be occupied by the surface water body. Therefore, the calculated 2,4-D concentration after the time it would take to travel the 25-foot distance is reduced by a factor of 0.42 and is below the MCL.



## Procedure for the Determination of Applicable Setback Distance:

MassGIS is in the process of upgrading its on-line GIS application services to include the GIS data layers that are required to be able to quickly determine whether a particular proposed 2,4-D application to a lake or pond can proceed and what setback distances would be required between the shoreline and any private drinking water wells. Until such time as the web-based public access to this information is available, DEP's Bureau of Resource Protection (BRP) will conduct GIS queries for proponents inquiring about specific locations for proposed 2,4-D application. Please contact Joe Cerutti at (617) 292-5859 for assistance.

For a specific proposed lake or pond application of 2,4-D, the proponent should conduct the following steps to determine whether the site meets any of the exclusionary conditions or to determine the applicable setback distance requirements between the shoreline and any private drinking water wells:

1. First the proponent must determine whether the lake or pond is either located within or abuts any Zone II or IWPA for public water supply wells. Furthermore, the proponent must determine whether the lake or pond falls within a Zone A, B, or C for a public surface water supply. This information is currently available in CD format from MassGIS. In the future it will be available through the MassGIS website (<http://www.state.ma.us/mgis/>) with USGS topographic map or orthophoto backgrounds. If any of the above is true, then the application of 2,4-D will not be permitted unless the proponent can demonstrate to BRP that the proposed application will not impact the public drinking water sources within the applicable protection zone and that no private drinking water wells

fall within the applicable setback distance established in this protocol. DEP recommends that the proponent discuss with BRP what additional information will be required prior to submitting the permit application. DEP will review any hydrologic or hydrogeologic information within the existing timeline for DEP approval.

2. If none of the above is true regarding public drinking water source protection areas, then the proponent should determine what portions, if any, of the developed properties within 200 feet of the lake or pond shore have access to public water supply service. If 100 percent of this area has access to a public water supply then the 2,4-D permit will be approved, provided that the lake or pond has not been precluded from 2,4-D application based upon the locations of public drinking water supply protection areas.

3. If less than 100 percent of the developed land within 200 feet of the downgradient lake or pond shore has access to a public water supply, then the proponent must determine the applicable private drinking water well setback distance(s) that applies. First the proponent should determine whether any of the land abutting the lake or pond is classified by MassGIS as medium or high yield aquifer deposits, or as sand and gravel or large sand surficial geology deposits. If any of these areas exist along the downgradient lake or pond shore, then a 200-foot setback distance will be required from all private drinking water wells that are located within these areas. If the surficial geology is mapped by MassGIS as sandy till over sand, end moraines, or floodplain alluvium, then a 50-foot setback distance will be required in the downgradient direction. If the surficial geology is mapped by MassGIS as till or bedrock, or fine-grained deposits then a 25-foot

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setback distance will be required.

4. The proponent may submit to DEP hydrologic/hydrogeologic information to determine the direction of groundwater flow to reduce the setback distance requirement from 200 feet or 50 feet (whichever is applicable) within the 200-foot or 50-foot setback distance from the downgradient shoreline. DEP recommends that the proponent discuss with BRP what additional information will be required prior to submitting the permit application.







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